UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/006,999	12/03/2001	Vance Faber	LIZA118255	1092

26389 7590 05/19/2005

CHRISTENSEN, O'CONNOR, JOHNSON, KINDNESS, PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

EXAMINER	
HUNG, YUBIN	

ART UNIT	PAPER NUMBER
2625	

DATE MAILED: 05/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/006,999 ✓	FABER ET AL.	
	Examiner	Art Unit	
	Yubin Hung	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 January 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) *19-38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/19/02 & 11/15/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of the species of Fig. 2 (related to claims 1-18) in the reply filed on January 27, 2005 is acknowledged.

Specification

2. The disclosure is objected to because of the following informalities:

- P. 34, line 13: "AZ^{v}" should have been "AZ^{n}"
- P. 45, line 14: "A_iX" should have been "AX"

Appropriate correction is required.

3. Claims 8, and similarly claim 15, are objected to because of informalities. The following corrections are required:

- Line 6: delete the extra "mapping"
- Line 7: change "theinteger" to "the integer"

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 7, 11, 12, 14, 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 7, and similarly claim 14, recites the limitation "the plurality of data values being zero" in line 2. it is not clear whether the plurality of data values refer to the input, the first output or the second output data values. **[Note: For examination purpose they will be interpreted as referring to the input data values.]**

7. Claim 11 recites the limitation "generated matrix" in the last line. There is insufficient antecedent basis for this limitation in the claim.

Claim 12 depends form claim 11 and therefore is similarly rejected.

8. Claim 17 recites the limitation "the step of modifying the at least one data value is performed on only adjacent data values in the plurality of input data values" is vague and ambiguous because the limitation appears to mean that adjacent input data values are modified. This being the case, if only one data value is modified, then "performed on only adjacent data values" is meaningless. **[Note: for examination purpose,**

"performed on only adjacent data values in the plurality of input data values" will be interpreted to mean that only adjacent data values are operated upon (e.g., linearly combined) to generate the modified data value(s).]

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 1-3, 6-8, 13-15, 17 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Calderbank et al. ("Wavelet Transforms that Map Integers to Integers," *Applied and Computation Harmonic Analysis*, Vol. 5, No. 3, 1998, pp.332-369).

Regarding claim 1, Calderbank discloses

- transforming a plurality of input data values using a computer, the first plurality of output data values approximating a second plurality of output data values, the second plurality of output data values generated by applying a linear transform to the plurality of input data values, the method comprising at least one step, the step being one of the following:
  - rearranging at least one data value in a plurality of current input data values
  - negating at least one data value in the plurality of current input data values
  - modifying at least one data value in the plurality of current input data values, each modified data value generated by applying a linear combination of unmodified values in the plurality of input data values to the at least one data value, the linear combination comprised of an integer generated in a reproducible

manner, the integer being from one of a group consisting of a rounded integer and a converted integer
- o a step which is equivalent to a successive combination of one or more steps of the preceding three types

[P. 19, Sec. 3.1-P. 20, line 18. Note that the first plurality of output data values are described by the left-hand side of Eq. 3.3; Eq. 3.1 defines a linear transform (the Haar transform, which is a wavelet transform) whose left-hand side are considered the second plurality of output data values and $S_{0,x}$, where x = 2l or 2l+1, are considered the plurality of input data values. Note further that the right-hand side of Eq. 3 is linear combinations of unmodified input data values and one of them is rounded. Eq. 3.4 shows the invertibility (i.e., reproducible).]

11. Regarding claims 2, 3 and 13, Calderbank further discloses

- (claim 2) the first plurality of output data values are integers if the plurality of input data values are integers
  [P. 1, Abstract; Sec. 3 from P. 19 to P. 26]
- (claim 3) the plurality of output data values can be reconstructed exactly from the first plurality of output data values
  [P. 20, Eq. 3.4]
- (claim 13) the linear transform is a wavelet transform
  [P. 1, Abstract; Sec. 3 from P. 19 to P. 26]

12. Regarding claim 6, Calderbanl-1 further discloses

- the linear transform is a fixed finite-dimensional linear transform
  [P. 19, Eq. 3.1. Note that the equation defines a 2-D, 2x2 Haar transform]

13. Regarding claim 7, and similarly claim 14, note that any invertible 2-dimensional diagonal matrix whose k-th (where k is the index of the only non-zero element of the input data values) diagonal element has a value of one (such as the identity matrix) satisfies the limitations.

14. Regarding claim 8, and similarly claim 15, note that a matrix (i.e., a linear transform) of a dimension suitable for the size of the input data, composing integral elements, e.g., an identity matrix, satisfies all its limitations:

- **the plurality of input data values includes an input integer plurality and the second plurality of output data values includes an output integer plurality**
- **the linear transform mapping an integer multiple of the input integer plurality to an integer multiple of the integer output plurality, the integer multiple of the input integer plurality corresponding to the integer multiple of the integer output plurality, and the method mapping the integer multiple of the integer input plurality to the corresponding integer multiple of the integer output plurality**

Note further that while Eq. 3.3 on page 20 of Calderbank uses the specific linear transform defined by Eq. 3.1 (see the analysis of claim 1) it can be applied to other linear transforms, including a matrix consisting of integral elements, in an obvious manner.

15. Regarding claim 17, Calderbank further discloses

- the step of modifying the at least one data value is performed on only adjacent data values in the plurality of input data values [P. 20 : Eq. 3.3]

16. Regarding claim 18, Calderbank further discloses the use of a 9-7 wavelet transform [P. 29, Sect. 4.4].

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

***

18. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Calderbank et al. ("Wavelet Transforms that Map Integers to Integers," *Applied and Computation Harmonic Analysis*, Vol. 5, No. 3, 1998, pp.332-369) as applied to claims 1, 2, 3, 6, 7, 13, 14, 17, 18, and further in view of Daubechies et al. ("Factoring Wavelet Transforms into Lifting Steps," *J. Fourier Analysis Applications*, Vol. 4, No. 3, 1998, pp. 247-269).

19. Regarding claim 4, Calderbank discloses all limitations of its parent, claim 1.

Calderbank does not expressly disclose

- `the linear transform has a determinant, the determinant being invertible as one of a group consisting of an integer and an integer Laurent polynomial`

However, Daubechies discloses the use of a linear transform that has a determinant with the recited characteristics [P. 8, last paragraph].

Calderbank and Daubechies are combinable because they both have aspects that are form the same field of endeavor of compression. [See Calderbank: Abstract, lines 5-8.]

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify Calderbank with the teaching of Daubechies by using a linear transform that has a determinant with the recited characteristics. The motivation would have been to have the perfect reconstruction property (see P. 8, Eq. 2 and the two lines above it).

Therefore it would have been obvious to combine Daubechies with Calderbank to obtain the invention as specified in claim 4.

20. Regarding claim 5, Daubechies further discloses

- rescaling at least one of a plurality of bands in the linear transform [P. 8, last four lines]

***

21. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baker et al. (US 5,790,110) and Feig et al. (US 5,523,847).

22. Regarding claims 9 and 10, Baker discloses

- (claim 9) the method of claim 6 wherein the linear transform is one of a plurality of RGB-to-YCrCb color transforms and
(claim 10) the method of claim 6 wherein the linear transform is an RGB-to-YIQ color transform
[Col. 11, lines 54-64]

Baker does not disclose the following limitations of their parents, claims 1 and 6, which Feig discloses:

- (claim 1) transforming a plurality of input data values using a computer, the first plurality of output data values approximating a second plurality of output data values, the second plurality of output data values generated by applying a linear transform to the plurality of input data values, the method comprising at least one step, the step being one of the following:
  - o rearranging at least one data value in a plurality of current input data values
  - o negating at least one data value in the plurality of current input data values
  - o modifying at least one data value in the plurality of current input data values, each modified data value generated by applying a linear combination of unmodified values in the plurality of input data values to the at least one data value, the linear combination comprised of an integer generated in a reproducible manner, the integer being from one of a group consisting of a rounded integer and a converted integer
  - o a step which is equivalent to a successive combination of one or more steps of the preceding three types

  [Col. 3, line 37-44 and Col. 8, line 11-Col. 12, line 44. Note that the examples of factorization (of various DCT transform matrices) shown in columns 8-11 clearly disclose that at different point of the processing some of the current input data values are permuted (i.e., rearranged) and others are replaced by a linear combination of unmodified values (e.g., see P_6 on column 9). Further note that while in some cases the product of the factors is the exact copy of the original matrix, in other cases an approximation to the original matrix. is obtained; see lines 18-44 of column 12. Rounding errors resulted from the limited precision of the underlying computer implementation can also result in the product of factors being an approximation of the original matrix. In any event, the input data values transformed by the matrix that is the product of factors are considered the *first* plurality of output data values and they clearly approximate the *second* plurality of output data values obtained by transforming the input data values using the original matrix.]
- (claim 6) the method of claim 1, wherein the linear transform is a fixed finite-dimensional linear transform
  [Cols. 8-11. Note that the DCT transforms, shown as the factorization examples, are 2-dimensional linear transforms]

Baker and Feig are combinable because they both have aspects that are form the same field of endeavor of color conversion.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify Baker with the teaching of Feig by applying the matrix factorization method to the recited color transformations. The motivation would have been to combine the non-trivial multiplications in a single process step to achieve faster processing speed, as Feig indicated in lines 37-39 of column 3.

Therefore it would have been obvious to combine Feig with Baker to obtain the invention as specified in claim 9 or 10.

***

23. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Feig et al. (US 5,523,847) and Calderbank et al. ("Wavelet Transforms that Map Integers to Integers," *Applied and Computation Harmonic Analysis*, Vol. 5, No. 3, 1998, pp.332-369).

24. Regarding claim 16, note that per the analysis of claims 9 and 10 above, Feig discloses all limitations of claim 1 that it depends from.

Feig further discloses the limitation specific to claim 16:

- the step of rearranging the at least one data value is performed on only adjacent data values in the plurality of input data values [Col. 9, matrix B3. Note that after multiplication by this matrix, the second input data will be moved to the third place]

Feig does not expressly disclose the limitation specific to its parent, claim 13:

- the linear transform is a wavelet transform

However, Calderbank discloses the use of a wavelet transform [P. 19, Eq. 3.1].

Calderbank and Feig are combinable because they both have aspects that are form the same field of endeavor of compression.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify Calderbank with the teaching of Feig by performing the step of rearranging the at least one data value is only on adjacent data values. The motivation would have been to combine the non-trivial multiplications in a single process step to achieve faster processing speed, as Feig indicated in lines 37-39 of column 3.

Therefore it would have been obvious to combine Feig with Calderbank to obtain the invention as specified in claim 16.

Allowable Subject Matter

25. Claim 11 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. In addition, claim 11 also needs to be rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office

action. Claim 12 depends from claim 11 and would be allowable when claim 11 is rewritten as required above.

Conclusion and Contact Information

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Yasuda et al. (US 5,054,103) – Discloses an encoding system that uses integer approximation of DCT transforms
- Ohta (US 5,703,799) – Discloses a reversible approximation of DCT transform that maps integers to integers
- Suarez et al. (US 6,278,753) – Discloses a method that factors polyphase matrices of wavelet transforms

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yubin Hung whose telephone number is (571) 272-7451. The examiner can normally be reached on 7:30 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Yubin Hung
Patent Examiner
May 11, 2005

BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600